CITY OF GRACE (PWS 6150010)
SOURCE WATER ASSESSMENT FINAL REPORT

November 4, 2002

State of Idaho
Department of Environmental Quality

Executive Summary

Under the Safe Drinking Water Act Amendments of 1996, all states are required by the U.S. Environmental Protection Agency (EPA) to assess every source of public drinking water for its relative sensitivity to contaminants regulated by the act. This assessment is based on a land use inventory of the designated assessment areas and sensitivity factors associated with the wells and springs, and their aquifer characteristics.

This report, *Source Water Assessment for City of Grace, Idaho*, describes the public water system (PWS), the boundaries of the zones of water contribution, and the associated potential contaminant sources located within these boundaries. This assessment should be used as a planning tool, taken into account with local knowledge and concerns, to develop and implement appropriate protection measures for this source. **The results should <u>not be</u> used as an absolute measure of risk and they should <u>not be</u> used to undermine public confidence in the water system.**

The City of Grace (PWS #6150010) is a community drinking water system located near State Route 34 in Caribou County. The system consists of two wells and 11 springs, of which this report covers nine of the springs (Hawk Springs 1, 2, 3, and Mac Springs 1, 4, 5, 6, 7, 8). Mac Springs 2 and 3 are not included in this assessment and will be appended at a later date. The wells help maintain storage reservoir water levels by supplementing the spring water during intervals of high water demand. The water system serves approximately 981 persons through 415 connections.

The potential contaminant sources within the delineated capture zones for Well #2 include a greenhouse. Additionally, the Bear River and its canal system cross the Well #1 and Well #2 delineations. If an accidental spill occurred into these surface water sources, inorganic chemical (IOC) contaminants, volatile organic chemical (VOC) contaminants, synthetic organic chemical (SOC) contaminants, or microbial contaminants could be added to the aquifer. Other potential contaminant sources identified within the delineated areas that may contribute to the overall vulnerability of the water sources were free-range cattle within the springs' delineations. The water system is working with the U.S. Forest Service so that grazing is not permitted in this area. A complete list of potential contaminant sources is provided with this assessment.

Final susceptibility scores are derived from equally weighting system construction scores, hydrologic sensitivity scores, and potential contaminant/land use scores. Therefore, a low rating in one or two categories coupled with a higher rating in other categories results in a final rating of low, moderate, or high susceptibility. With the potential contaminants associated with most urban and heavily agricultural areas, the best score a well or spring can get is moderate. Potential contaminants are divided into four categories, IOCs (i.e. nitrates, arsenic), VOCs (i.e. petroleum products), SOCs (i.e. pesticides), and microbial contaminants (i.e. total coliform bacteria). As different wells or springs can be subject to various contamination settings, separate scores are given for each type of contaminant.

For the assessment, a review of laboratory tests was conducted using the Idaho Drinking Water Information Management System (DWIMS), the State Drinking Water Information System (SDWIS), and hard copy laboratory results. No SOCs have been detected in the wells or the springs. The VOCs bromoform, chloroform, bromodichloromethane, and chlorodibromomethane identified as disinfection byproducts related to chlorine were detected in water from the springs and Well #2. The IOCs barium, fluoride, mercury, nitrate, and selenium have been detected in tested water, but in concentrations below the maximum contaminant level (MCL) for each chemical set by the EPA. Despite Well #1 and Well #2 existing in a nitrate priority area, nitrate levels were below the MCL of 10.0 mg/L. Nitrate concentrations in Well #1 ranged from 1.1 milligrams per liter (mg/L) to 2.8 mg/L. In Well #2, concentrations ranged from 1.1 mg/L to 5.89 mg/L with the peak concentration found in February 1980. Since 2000, nitrate levels in Well #2 have been increasing. In the springs, nitrate concentrations range from 1.0 to 1.2 mg/L. Total coliform bacteria have been detected within the distribution system between August 1996 and December 2001. Bacteria were present in the springs while they were under construction in February 2000.

Microscopic Particulate Analysis (MPA) tests were conducted on the springs in McPherson Canyon and Hawkins Canyon in June 1995 and June 1996. Based on laboratory results, the spring sources for the City of Grace were determined to be groundwater not under the influence of surface water (DEQ sanitary survey, 2000).

In terms of total susceptibility, Well #1 rated moderate for IOCs, VOCs, SOCs, and microbial contaminants. Both the system construction and hydrologic sensitivity scores were rated as moderate. The potential contaminant and land use scores rated moderate for IOCs, VOCs and SOCs, and low for microbial contaminants. The total susceptibility for Well #2 was high for IOCs, VOCs, SOCs, and microbial contaminants. The system construction and hydrologic sensitivity score were rated as high. The potential contaminant and land use scores were rated high for IOCs, moderate for VOCs and SOCs, and low for microbial contaminants. Although there is pastureland near Well #2, it is outside the fenced 50-foot sanitary setback distance for the well. For the Hawk Springs 1, 2, and 3, and Mac Springs 1, 4, 5, 6, 7, and 8, the final susceptibility ratings were low for IOCs, VOCs, SOCs, and microbial contaminants. Each spring rated moderate for system construction, and potential contaminant and land use scores were low for IOCs, VOCs, SOCs, and microbial contaminants.

This assessment should be used as a basis for determining appropriate new protection measures or re-evaluating existing protection efforts. No matter what ranking a source receives, protection is always important. Whether the source is currently located in a “pristine” area or an area with numerous industrial and/or agricultural land uses that require surveillance, the way to ensure good water quality in the future is to act now to protect valuable water supply resources. If the system should need to expand in the future, new well or spring sites should be located in areas with as few potential sources of contamination as possible, and the site should be reserved and protected for this specific use.

For the City of Grace, drinking water protection activities should first focus on correcting any deficiencies outlined in the sanitary survey (an inspection conducted every five years with the purpose of determining the physical condition of a water system's components and its capacity). As land uses within most of the source water assessment areas are outside the direct jurisdiction of the City of Grace, collaboration and partnerships with federal, state and local agencies and industry groups should be established and are critical to success.

Due to the time involved with the movement of ground water, drinking water protection activities should be aimed at long-term management strategies even though these strategies may not yield results in the near term. There are multiple resources available to help communities implement protection programs, including the Drinking Water Academy of the EPA. As public land intersects the delineations, the Forest Service and Bureau of Land Management may need to be contacted to assist with protection efforts. Drinking water protection activities related to agricultural practices should be coordinated with the Idaho State Department of Agriculture, and the Caribou County Soil and Water Conservation District.

A community must incorporate a variety of strategies in order to develop a comprehensive drinking water protection plan, be they regulatory in nature (i.e. zoning, permitting) or non-regulatory in nature (i.e. good housekeeping, public education, specific best management practices). For assistance in developing protection strategies please contact the Pocatello Regional Office of the Idaho Department of Environmental Quality or the Idaho Rural Water Association.

SOURCE WATER ASSESSMENT FOR CITY OF GRACE, IDAHO

Section 1. Introduction - Basis for Assessment

The following sections contain information necessary to understand how and why this assessment was conducted. **It is important to review this information to understand what the ranking of this assessment means.** Maps showing the delineated source water assessment area and the inventory of significant potential sources of contamination identified within that area are included. The list of significant potential contaminant source categories and their rankings used to develop the assessment also is included.

Level of Accuracy and Purpose of the Assessment

The Idaho Department of Environmental Quality (DEQ) is required by the U.S. Environmental Protection Agency (EPA) to assess over 2,900 public drinking water sources in Idaho for their relative susceptibility to contaminants regulated by the Safe Drinking Water Act. This assessment is based on a land use inventory of the delineated assessment area, sensitivity factors associated with the wells and springs, and aquifer characteristics. All assessments must be completed by May of 2003. The resources and time available to accomplish assessments are limited. Therefore, an in-depth, site-specific investigation to identify each significant potential source of contamination for every public water system is not possible. **This assessment should be used as a planning tool, taken into account with local knowledge and concerns, to develop and implement appropriate protection measures for this source. The results should not be used as an absolute measure of risk and they should not be used to undermine public confidence in the water system.**

The ultimate goal of the assessment is to provide data to local communities to develop a protection strategy for their drinking water supply system. DEQ recognizes that pollution prevention activities generally require less time and money to implement than treatment of a public water supply system once it has been contaminated. DEQ encourages communities to balance resource protection with economic growth and development. The information necessary to develop a drinking water protection program should be determined by the local community and be based upon its own needs and limitations. Wellhead or drinking water protection is one facet of a comprehensive growth plan, and it can complement ongoing local planning efforts.

Section 2. Conducting the Assessment

General Description of the Source Water Quality

The City of Grace (PWS #6150010) is a community drinking water system located near State Route 34 in Caribou County. The system consists of two wells and 11 springs, of which nine of these springs (Hawk Spring 1, 2, 3, and Mac Springs 1, 4, 5, 6, 7, 8) will be covered in this report (Figure 1). Mac Springs 2 and 3 are not included in this assessment and will be appended at a later date. The springs supply water for the system and the wells are activated to meet increased water demands during peak usage. The system currently serves approximately 981 persons through 415 connections.

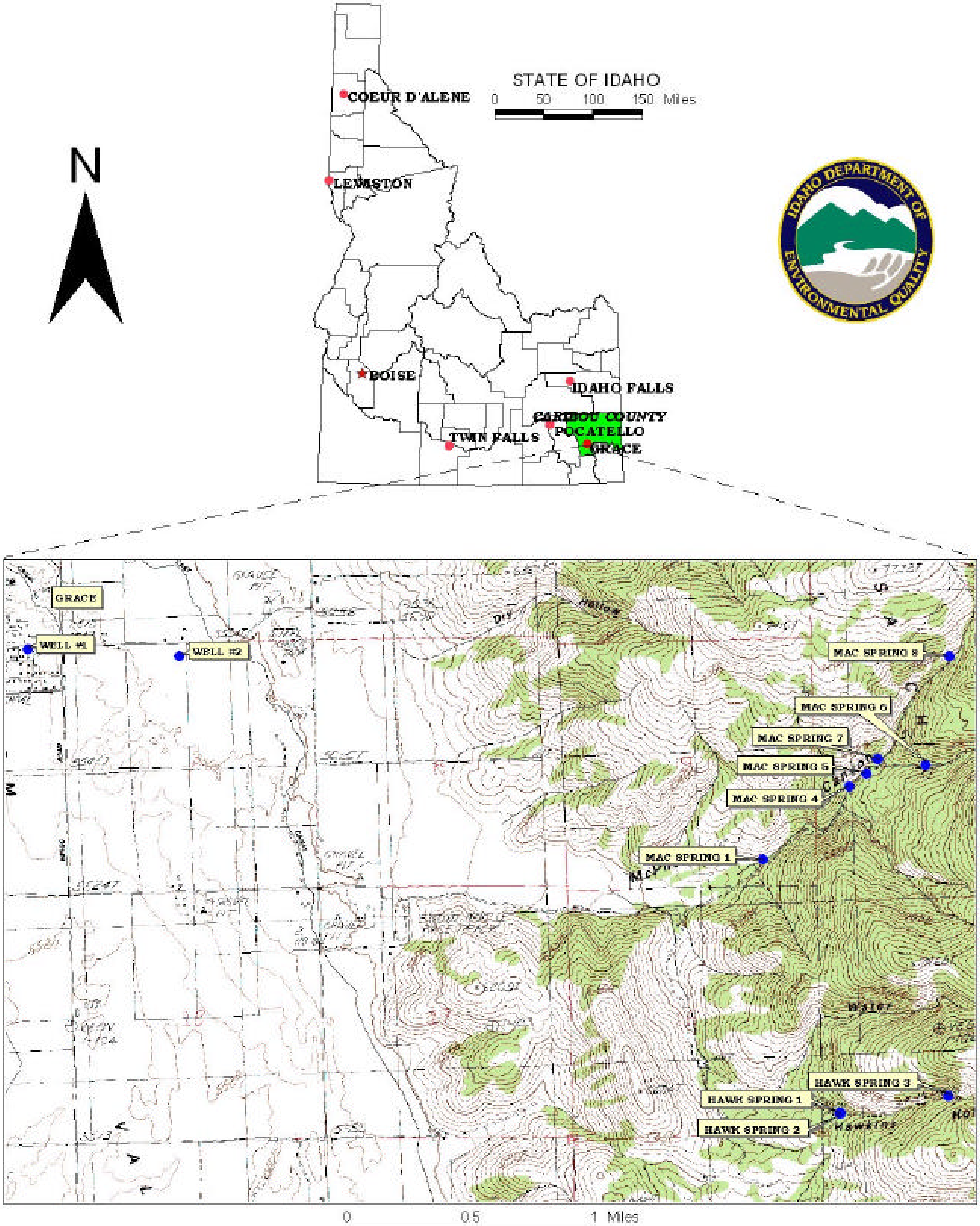
For the assessment, a review of laboratory tests was conducted using the Idaho Drinking Water Information Management System (DWIMS), the State Drinking Water Information System (SDWIS), and hard copy laboratory results. No synthetic organic chemicals (SOCs) have been detected in the wells or the springs. The volatile organic chemicals (VOCs) bromoform, chloroform, bromodichloromethane, and chlorodibromomethane identified as disinfection byproducts related to chlorine, were detected in water from the springs and Well #2. The inorganic chemicals (IOCs) barium, fluoride, mercury, nitrate, and selenium have been detected in tested water, but in concentrations below the maximum contaminant level (MCL) for each chemical set by the EPA. Despite Well #1 and Well #2 existing in a nitrate priority area, nitrate levels were below the MCL of 10.0 mg/L. Nitrate concentrations in Well #1 ranged from 1.1 milligrams per liter (mg/L) to 2.8 mg/L. In Well #2, concentrations range from 1.1 mg/L to 5.89 mg/L with the peak concentration found in February 1980. Since 2000, nitrate levels in Well #2 have been increasing. In the springs, nitrate concentrations range from 1.0 to 1.2 mg/L. Total coliform bacteria have been detected within the distribution system between August 1996 and December 2001. Bacteria were present in the springs while they were under construction in February 2000.

Microscopic Particulate Analysis (MPA) tests were conducted on the springs in McPherson Canyon and Hawkins Canyon in June 1995 and June 1996. Based on laboratory results, the spring sources for the City of Grace were determined to be groundwater not under the influence of surface water (DEQ sanitary survey, 2000).

Defining the Zones of Contribution – Delineation

The delineation process establishes the physical area around a well or spring that will become the focal point of the assessment. The process includes mapping the boundaries of the zone of contribution into time-of-travel (TOT) zones (zones indicating the number of years necessary for a particle of water to reach a pumping well or flowing spring) for water in the aquifer. Washington Group International (WGI) was contracted by DEQ to define the PWS's zones of contribution. WGI used a conceptual computer model approved by the EPA in determining the 3-year (Zone 1B), 6-year (Zone 2), and 10-year (Zone 3) TOT for water associated with the Gem Valley – Gentile Valley hydrologic province in the vicinity of the City of Grace. The computer model used site specific data, assimilated by WGI from a variety of sources including operator records, well logs (when available) and hydrogeologic reports. A summary of the hydrogeologic information from the WGI is provided below.

FIGURE 1. Geographic Location of the City of Grace



Hydrogeologic Conceptual Model

The Bear River originates in the Uinta Mountains of northern Utah and winds its way through over 500 miles of Wyoming, Idaho, and Utah to terminate in a freshwater bay of the Great Salt Lake just 90 miles west of its source (Dion, 1969, p. 6). The Bear River enters Idaho near Border, Wyoming and flows along the north edge of the Bear River Plateau. Flowing north through the Bear River – Dingle Swamp hydrologic province, it passes into the Soda Springs hydrologic province east of the Bear River Range. Upon entering the Gem Valley – Gentile Valley hydrologic province, it swings south. Now west of the Bear River Range, the river passes through the Oneida Narrows into the Cache Valley hydrologic province. Over most of its course through Idaho, the Bear River is gaining and in direct hydraulic communication with the major aquifer systems of the four hydrologic provinces. The exception is a small reach between the cities of Alexander and Grace where it is generally losing and is perched over the regional fractured basalt aquifer (Dion, 1969, p. 30). Ground water in the Bear River Basin is found in Holocene alluvium, Pleistocene basalt, and rocks of the "Pliocene (?)" [sic] Salt Lake Formation, pre-Tertiary undifferentiated bedrock, and possibly the "Eocene (?)" [sic] Wasatch Formation (Dion, 1969, pp. 15 and 16). Rocks of the Salt Lake Formation, which include freshwater limestone, tuffaceous sandstone, rhyolite tuff and poorly-consolidated conglomerate, outcrop along the major valley margins and may underlie the valley-fill alluvium (Dion, 1969, pp. 16 and 17). Many of the wells drilled into this formation do not yield water. The few wells that do produce water yield as much as 1,800 gallons/minute from beds of sandstone and conglomerate.

The Wasatch Formation is restricted to the Bear Lake Plateau and small areas northwest of Bear Lake (Dion, 1969, p. 17). The formation is composed largely of tightly cemented conglomerate and sandstone with smaller amounts of shale, limestone, and tuff. The primary pore space is typically impermeable. Water movement may occur through joints and fractures or more permeable zones that are thought to exist along the relatively flat-lying formation (Dion, 1969, p. 17). Springs occur at the margins of the formation.

Precipitation in the basin ranges from 10 inches/year on the floor of Bear Lake Valley to over 45 inches/year on the Bear River Range (Dion, 1969, pp. VII and 11). Applied over the entire basin, precipitation amounts to approximately 2.3 million acre-feet annually. Precipitation is also the principal source of recharge to the basin's aquifers in conjunction with spring snowmelt and runoff, irrigation seepage, and canal losses.

Natural ground water discharge is by flow to the Bear River, springs, seeps along river banks, and evapotranspiration in large marshy areas (Dion, 1969, p. VIII). Some discharge may also occur by way of underflow to the Portneuf River drainage through basalt flows at Tenmile pass and near Soda Point.

Ground water is obtained from both springs and wells in the Bear River Basin. Hundreds of springs issue primarily from fractures and solution openings in the bedrock on the margins of the basin (Dion, 1969, p. 47). Water production from wells in the four hydrologic provinces is primarily from alluvial and basalt aquifers; however, some wells tap conglomerate, sandstone, limestone and shale aquifers of the Salt Lake and possibly the Wasatch formations (Dion, 1969, p. VII).

Gem Valley – Gentile Valley Hydrologic Province

The Gem Valley – Gentile Valley hydrologic province occupies approximately 144 square miles west of the Soda Springs hydrologic province. The Basin and Range physiographic province is north to south trending and is bounded on the east by the Bear River Range and on the west by the Portneuf Range. Average annual precipitation on the valley floor is assumed to be of similar magnitude to the values for Soda Springs and Cache Valley because of proximity and intermediate elevation.

The Gem and Gentile Valley floors consist of Quaternary gravels, sands, silts, and clays, and Quaternary and Tertiary olivine basalt flows. The sediments are more prevalent in the Gentile Valley and are the primary water-producing units. The basalt flows found primarily in Gem Valley overlie and interfinger sediment deposits (Dion, 1969, p. 16). The basalts are the principal aquifer in Gem Valley.

A broad northwest trending mound of water forms a ground water divide in the basalt aquifer north and west of the town of Alexander (Dion, 1969, p. 19 and Figure 5, and Norton, 1981, Figure 5). Water north of the divide flows to the Snake River Basin, and water to the south flows to the Bear River Basin. The general ground water flow direction south of the divide is to the Bear River.

The primary source of recharge to the basalt aquifer is underflow from the aquifer in the Soda Springs hydrologic province. Other sources are precipitation on the valley floor and the mountains, percolation from irrigation, canal leakage, and stream losses (Norton, 1981, p. 11, and Dion, 1974, p.19). The alluvial aquifer in Gentile Valley is recharged by surface water along the valley margins and by precipitation on the alluvium. Ground water is discharged from both aquifers by the hundreds of springs and seeps along the Bear River, evapotranspiration, underflow to the Portneuf Valley, and wells (Norton, 1981, p. 11, and Dion, 1969, p. 19).

Capture Zone Modeling for Wells

The refined method (IDEQ, 1997, p. 4-9) was applied to delineate capture zones for the two City of Grace wells using the analytic element model WhAEM2000 (Kraemer et al., 2000). Method selection was based on an assessment of hydrogeologic uncertainty as affected by the quantity and quality of available information.

For purposes of capture zone delineation, backup wells were treated as primary wells that are pumped continuously. For the models that contained backup well(s), the PWS primary well(s) were pumped, while the backup well(s) were shut off. A separate simulation was then run with the primary well(s) shut off and the backup well(s) pumping at the same rate as the primary well(s) in the original simulation.

The areal recharge was 0.66 inches/year (0.00015 feet/day) in the base case model run. The base case hydraulic conductivity of 73 feet/day was estimated using specific capacity data from the City of Grace Well #2. The effective porosity is 0.1, which is the default value presented in Table F-3 of the Idaho Wellhead Protection Plan for Columbia River Basalts (IDEQ, 1997, p. F-6). Base elevation of the aquifer was set at the approximate elevation of the bottom of Well #1 (5,280 feet mean sea level). The aquifer thickness is the average perforated interval of both City of Grace wells (50 feet).

The capture zones for the City of Grace PWS wells terminate at the Bear River within 6 years. This prediction is based on the assumption that the Bear River has a leakage rate that is sufficient to meet the pumping demand of 0.2 $feet^3$/second. The average total area of the capture zones is 620 acres (Attachment A; Figures 2 and 3).

Spring Delineation Methods

Delineation of the wellhead protection area for a spring involves special consideration. Hydrogeologic setting is foremost among the factors that control the shape and extent of the capture zone. The capture zone for a spring resulting from the presence of a high permeability fracture extending to great depth, will be much different from the capture zone resulting from a depression spring formed where the ground surface intersects the water table in a unconsolidated aquifer

The topographic method was used for springs that (1) are located within relatively small drainage basins with easily definable divides, (2) have an average annual discharge that can be reasonably supplied by an average annual precipitation in the drainage, and (3) have characteristics of a shallow system such as seasonal variations in discharge and temperature. In this case, the City of Grace springs were delineated using the topographic method. The topographic method involves the use of topographic maps to locate boundaries of surface drainage basins around springs. Geomorphic analysis uses both geologic and topographic analyses and applies geomorphic principles to infer subsurface structures from landforms (Jensen et al., 1997, pp. 7-8).

Surface water and ground water divides are assumed to be equivalent when applying the topographic method because ground water divides often mirror drainage basin divides in shallow water table aquifers. Calculating the available recharge within a catchment area is useful for evaluating the validity of this assumption. This information can also be used to determine if the zone of contribution is of adequate area to supply the volume of water discharged by the spring.

Topographic maps (1:24,000 scale) were examined to identify the topographic divides bounding the drainage basins surrounding the springs for the City of Grace. The assumption was made that ground water divides, which represent hydrologic boundaries to ground water flow, are coincident with the topographic divides. Perennial streams or other surface water bodies that may imply the presence of hydrologic boundaries were identified.

Surface geologic maps were also used to identify low-permeability lithologic units that may form ground water flow boundaries and to infer the extent of lithologic units that provide water to springs. The reasonableness of a topographic delineation was checked by calculating the amount of recharge needed to produce the average reported spring discharge. The required recharge was then compared to the average yearly precipitation in the area surrounding the spring.

The delineated source water assessment area for each City of Grace spring can best be described as the drainage basin upgradient of each individual spring (Attachment A; Figures 4 - 11). The actual data used by WGI in determining the source water delineation areas for the wells and springs is available from IDEQ upon request.

Identifying Potential Sources of Contamination

A potential source of contamination is defined as any facility or activity that stores, uses, or produces, as a product or by-product, the contaminants regulated under the Safe Drinking Water Act. Furthermore, these sources have a sufficient likelihood of releasing such contaminants into the environment at levels that could pose a concern relative to drinking water sources. The goal of the inventory process is to locate and describe those facilities, land uses, and environmental conditions that are potential sources of ground water contamination. Field surveys conducted by IDEQ and reviews of available databases identified potential contaminant sources within the delineation areas.

It is important to understand that a release may never occur from a potential source of contamination provided they are using best management practices. Many potential sources of contamination are regulated at the federal level, state level, or both, to reduce the risk of release. Therefore, when a business or facility is identified as a potential contaminant source, this should not be interpreted to mean that this business or facility is in violation of any local, state, or federal environmental law or regulation. What it does mean is that the potential for contamination exists due to the nature of the business or facility. There are a number of methods that water systems can use to work cooperatively with potential sources of contamination, including educational visits and inspections of stored materials. Owners of these businesses or facilities may not be aware that they are located near a public water supply well.

Contaminant Source Inventory Process

A two-phased contaminant inventory of the study area was conducted in February and June 2002. The first phase involved identifying and documenting potential contaminant sources within the City of Grace source water assessment areas through the use of computer databases and Geographic Information System (GIS) maps developed by IDEQ. The second, or enhanced, phase of the contaminant inventory involved contacting the operator to identify and add any additional potential contaminant sources in the delineated areas. With the assistance of Ray Welker, no additional potential contaminant sources were found within the delineated source water areas for the wells or springs. Maps with well and spring locations, delineated areas and potential contaminant sources are provided with this report (Attachment A; Figures 2 - 11). Each potential contaminant source has been given a unique site number that references tabular information associated with the public water sources (Tables 1 - 4).

Table 1. City of Grace, Well #1, Potential Contaminant Inventory

Site #	Source Description	TOT Zone[1] (years)	Source of Information	Potential Contaminants[2]
	Bear River and canal system	0 –3	GIS Map	IOC, VOC, SOC, microbials
	Bear River and canal system	3 –6	GIS Map	IOC, VOC, SOC

[1] TOT = time-of-travel (in years) for a potential contaminant to reach the wellhead
[2] IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical

Table 2. City of Grace, Well #2, Potential Contaminant Inventory

Site #	Source Description	TOT Zone[1] (years)	Source of Information	Potential Contaminants[2]
1	Greenhouse	0 –3	Database Search	IOC, SOC, microbials
	Bear River and canal system	0 –3	GIS Map	IOC, VOC, SOC, microbials
	Bear River and canal system	3 –6	GIS Map	IOC, VOC, SOC

[1] TOT = time-of-travel (in years) for a potential contaminant to reach the wellhead
[2] IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical

Table 3. City of Grace, Hawk Spring 1, 2, 3, Potential Contaminant Inventory

Site #	Source Description	TOT Zone[1] (years)	Source of Information	Potential Contaminants[2]
	Free range cattle (Plans to remove permit by January 2003)	0 –3	2000 Sanitary Survey	IOC, microbials

[1] TOT = time-of-travel (in years) for a potential contaminant to reach the wellhead
[2] IOC = inorganic chemical

Table 4. City of Grace, Mac Spring 1, 4, 5, 6, 7, 8, Potential Contaminant Inventory

Site #	Source Description	TOT Zone[1] (years)	Source of Information	Potential Contaminants[2]
	Free range cattle (Plans to remove permit by January 2003)	0 –3	2000 Sanitary Survey	IOC, microbials

[1] TOT = time-of-travel (in years) for a potential contaminant to reach the wellhead
[2] IOC = inorganic chemical

Section 3. Susceptibility Analyses

The susceptibility to contamination for the wells and springs were ranked as high, moderate, or low risk according to the following considerations: construction, land use characteristics, potentially significant contaminant sources, and hydrologic characteristics (wells only). The susceptibility rankings are specific to a particular potential contaminant or category of contaminants. Therefore, a high susceptibility rating relative to one potential contaminant does not mean that the water system is at the same risk for all other potential contaminants. The relative ranking that is derived for each well or spring is a qualitative, screening-level step that, in many cases, uses generalized assumptions and best professional judgement. Attachment A contains the susceptibility analysis worksheets. The following summaries describe the rationale for the susceptibility ranking.

Well Hydrologic Sensitivity

The hydrologic sensitivity of a well is dependent upon four factors: These factors are surface soil composition, the material in the vadose zone (between the land surface and the water table), the depth to first ground water, and the presence of a 50-foot thick fine-grained zone (aquitard) above the producing zone of the well. Slowly draining soils such as silt and clay typically are more protective of ground water than coarse-grained soils such as sand and gravel. Similarly, fine-grained sediments in the subsurface and a water depth of more than 300 feet protect the ground water from contamination.

Well #1 rated moderate for hydrologic sensitivity. The well log indicated that an aquitard is present, and the vadose zone is predominantly composed of massive lava, cinders, and minor amounts of clay. The depth to first water is less than 300 feet (static water level is 112 feet below ground surface (bgs)), and area soils are defined as moderate to well drained as defined by the National Resource Conservation Service (NRCS).

Well #2 rated high for hydrologic sensitivity. The well log indicated the vadose zone is predominantly composed of broken lava and cinders, with the static water level approximately 160 feet bgs. The first depth to ground water is less than 300 feet, and there is no aquitard present above the static water level. In addition, area soils are defined as moderate to well drained as defined by the NRCS.

System Construction

Wells

Well construction directly affects the ability of the well to protect the aquifer from contaminants. System construction scores are reduced when information shows that potential contaminants will have a more difficult time reaching the intake of the well. Lower scores imply a system is less vulnerable to contamination. For example, if the well casing and annular seal both extend into a low permeability unit, then the possibility of contamination is reduced and the system construction score goes down. If the highest production interval is more than 100 feet below the water table, then the system is considered to have better buffering capabilities. If the wellhead and surface seal are maintained to standards, as outlined in sanitary surveys, then contamination down the well bore is less likely. If the well is protected from surface flooding and is outside the 100-year floodplain, then contamination from surface events is reduced.

Well #1 rated moderate for system construction. The well was constructed in 1989 to a depth of 222 feet. The well has a 16-inch diameter casing placed to 20 feet bgs with an inner 12-inch diameter casing set to 218 feet bgs into hard lava. Both casings for Well #1 are 0.250 inches thick. The well casing is perforated from 158 feet to 218 feet bgs. The highest water producing zone for the well is less than 100 feet below the static water level (112 feet bgs). A cement grout annular seal was placed to a depth of 20 feet into hard massive lava, and the well casing does not extend into a low permeable unit. The well is located outside of a 100-year floodplain. Although the well head and surface seal are in acceptable condition, there is no well vent (DEQ sanitary survey, 2000). Venting the well may prevent a vacuum from forming when the pump is turned on, causing the casing to slough. The vent should also be covered with a 24-mesh screen to prevent animal and insects from accessing the well column.

Well #2 rated high for system construction. The well was constructed in 1980 to a depth of 240 feet and its 16-inch diameter, 0.375-inch thick casing was seated into broken gray lava and cinders. Perforations exist between 200 and 240 feet and are bounded above by soft gray basalt and bounded below by broken gray lava and cinders. A cement grout annular seal is seated at 18 feet bgs into hard gray lava. The well is located outside of the 100-year floodplain. The highest production of water is less than 100 feet below static water level (160 feet) and the casing is not seated into a low permeability unit. Although the wellhead is vented, the vent needs to be downturned and screened (DEQ Sanitary Survey, 2000).

The Idaho Department of Water Resources (IDWR) *Well Construction Standards Rules (1993)* require all public water systems to follow IDEQ standards. IDAPA 58.01.08.550 requires that PWSs follow the *Recommended Standards for Water Works (1997)* during construction. Under current standards, all PWS wells are required to have a 50-foot buffer around the wellhead and if the well is designed to yield greater than 50 gallons per minute (gpm) a minimum of a 6-hour pump test is required. These standards are used to rate the system construction for the well by evaluating items such as condition of wellhead and surface seal, whether the casing and annular space is within consolidated material or 18 feet below the surface, the thickness of the casing, etc. Twelve and sixteen inch casings require a casing thickness of 0.375 inches. If all criteria are not met, the public water source does not meet the IDWR Well Construction Standards. In this case, both Well #1 and Well #2 do no meet all the criteria outlined in the IDWR Well Construction Standards.

Springs

Spring construction scores are determined by evaluating whether the spring has been constructed according to Idaho Code (IDAPA 58.01.08.04) and if the spring's water is exposed to any potential contaminants from the time it exits the bedrock to when it enters the distribution system. If the spring's intake structure, infiltration gallery, and housing are located and constructed in such a manner as to be permanent and protect it from all potential contaminants, is contained within a fenced area of at least 100 feet in diameter, and is protected from all surface water by diversions, berms, etc., then Idaho Code is being met and the score will be lower. If the spring's water comes in contact with the open atmosphere before it enters the distribution system, it receives a higher score. Likewise, if the spring's water is piped directly from the bedrock to the distribution system or is collected in a protected spring box without any contact to potential surface-related contaminants, the score is lower.

The springs were reconstructed in 1990 as part of an "eminent threat" project in response to Giardia contamination. They were developed by digging into each spring and placing perforated PVC pipe in a layer of drain rock about 5 to 20 feet below the surface. A PVC membrane was placed over the whole collection area, then attached to 6-inch and 8-inch PVC pipe and gravity fed to the storage reservoir (IDEQ sanitary survey, 1994 and 2000). Most of the springs have diversion ditches to carry surface water away from the collection areas. All of the springs are located on U.S. Forest Service property. The 1994 sanitary survey indicated that the spring lots were not properly fenced, but there is a locked gate that provides access to the spring lots in McPherson Canyon, and a fence and gate to keep livestock out of the collection areas up

Hawkins Canyon (IDEQ sanitary survey, 2000). The springs rated moderate for system construction due to reconstruction efforts so that the collected water is not exposed to atmospheric or surface related potential contaminants. Although the springs have been reconstructed to code, they are not fenced to meet the required sanitary setback of 100 feet around each source.

Potential Contaminant Sources and Land Use

The potential contaminant sources and land use within the delineated zone of water contribution is assessed to determine each well's or spring's susceptibility. When agriculture is the predominant land use in the area, this may increase the likelihood of agricultural wastewater infiltrating the ground water system. Agricultural land is counted as a source of leachable contaminants and points are assigned to this rating based on the percentage of agricultural land. For the wells, the land use in this area is considered irrigated cropland. The springs are located on U.S. Forest Service land that is not dominated by agricultural use.

Well #1 rated moderate for IOCs (i.e. nitrates, arsenic), VOCs (i.e. petroleum products), SOCs (i.e. pesticides), and low for microbial contaminants (i.e. total coliform). Well #2 rated high for IOCs, moderate for VOCs and SOCs, and low for microbial contaminants. A greenhouse was identified as a potential contaminant source for Well #2, and the Bear River and network of canals are considered surface water corridors that could add contaminants to the ground water. In addition, there is pasture land adjacent to Well #2 that is outside the fenced 50-foot sanitary setback for the drinking water source. The Bear River County-wide herbicide use for Well #1 and Well #2 is high, and the wells exist within a nitrate priority area.

Each spring rated low for IOCs, VOCs, SOCs, and microbial contaminants. The springs' water is considered susceptible due to free range cattle within the delineations. Grazing upgradient from water collection areas may introduce IOCs and microbial contaminants. The system is working with the U.S. Forest Service so that grazing near the springs will not be permitted (communication, 2002). The county level herbicide usage for the Hawk springs 1, 2, 3 and Mac Springs 7, and 8 is high.

Final Susceptibility Ranking

A detection above a drinking water standard MCL, or any detection of a VOC or SOC will automatically give a high susceptibility rating to that well or spring despite the land use of the area because a pathway for contamination already exists. Additionally, potential contaminant sources within 50 feet of a wellhead will automatically lead to a high susceptibility rating. Hydrologic sensitivity and system construction scores are heavily weighted in the final scores. Having multiple potential contaminant sources in the 0- to 3-year time of travel zone (Zone 1B) contribute greatly to the overall ranking.

Susceptibility Summary

In terms of total susceptibility, Well #1 rated moderate for IOCs, VOCs, SOCs, and microbial contamination. System construction and hydrologic sensitivity scores were moderate, while the potential contaminant and land use scores were moderate for IOCs, VOCs, and SOCs, and low for microbial contamination. Well #2 rated high for IOCs, VOCs, SOCs, and microbial contamination. The system construction and hydrologic sensitivity scores rated as high. The potential contaminant and land use scores were rated as high for IOCs, moderate for VOCs and SOCs, and low for microbial contamination. The Hawk Springs 1, 2, and 3, and Mac Springs 1, 4, 5, 6, 7, and 8 rated low for IOCs, VOCs, SOCs, and microbial contamination. The system construction rated moderate for each of the springs, and potential contaminant and land use scores were low for IOCs, VOCs, SOCs, and microbial contamination. Refer to Table 5 for susceptibility ratings.

No SOCs have been detected in the wells or the springs. The VOCs bromoform, chloroform, bromodichloromethane, and chlorodibromomethane were identified in the springs and Well #2, but are disinfection byproducts related to chlorination. The IOCs barium, fluoride, mercury, nitrate, and selenium have been detected in the drinking water, but in concentrations below each chemical's MCL set by the EPA. Total coliform bacteria have been detected within the distribution system between August 1996 and December 2001. Bacteria were present in the springs while they were under construction in February 2000.

Table 5. Summary of City of Grace Susceptibility Evaluation

Drinking Water Source	Susceptibility Scores[1]									
	Hydrologic Sensitivity	Potential Contaminant Inventory and Land Use				System Construction	Final Susceptibility Ranking			
		IOC	VOC	SOC	Microbials		IOC	VOC	SOC	Microbials
Well #1	M	M	M	M	L	M	M	M	M	M
Well #2	H	H	M	M	L	H	H	H	H	H
Hawk Spring 1	NA	L	L	L	L	M	L	L	L	L
Hawk Spring 2	NA	L	L	L	L	M	L	L	L	L
Hawk Spring 3	NA	L	L	L	L	M	L	L	L	L
Mac Spring 1	NA	L	L	L	L	M	L	L	L	L
Mac Spring 4	NA	L	L	L	L	M	L	L	L	L
Mac Spring 5	NA	L	L	L	L	M	L	L	L	L
Mac Spring 6	NA	L	L	L	L	M	L	L	L	L
Mac Spring 7	NA	L	L	L	L	M	L	L	L	L
Mac Spring 8	NA	L	L	L	L	M	L	L	L	L

[1]H = High Susceptibility, M = Moderate Susceptibility, L = Low Susceptibility,
IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical
NA= not applicable

Section 4. Options for Drinking Water Protection

This assessment should be used as a basis for determining appropriate new protection measures or re-evaluating existing protection efforts. No matter what ranking a source receives, protection is always important. Whether the source is currently located in a “pristine” area or an area with numerous industrial and/or agricultural land uses that require surveillance, the way to ensure good water quality in the future is to act now to protect valuable water supply resources. If the system should need to expand in the future, new well or spring sites should be located in areas with as few potential sources of contamination as possible, and the site should be reserved and protected for this specific use.

An effective drinking water protection program is tailored to the particular local drinking water protection area. A community with a fully developed source water protection program will incorporate many strategies. For the City of Grace, drinking water protection activities should first focus on correcting any deficiencies outlined in the sanitary survey. No potential contaminants (livestock, pesticides, paint, fuel, cleaning supplies, etc.) should be stored or applied within 50 feet of the wells or 100 feet of the springs. Debris (bottles, old wood, etc.) around well houses should be removed (DEQ, 2002). As land uses within most of the source water assessment areas are outside the direct jurisdiction of the City of Grace, making collaboration and partnerships with state and local agencies, and industrial and commercial groups is important to ensure future land uses are protective of ground water quality.

Due to the time involved with the movement of ground water, drinking water protection activities should be aimed at long-term management strategies even though these strategies may not yield results in the near term. A strong public education program should be a primary focus of any drinking water protection plan as the delineation contains some urban and residential land uses. There are multiple resources available to help communities implement protection programs, including the Drinking Water Academy of the U.S. EPA. Drinking water protection activities within the delineations should be coordinated with the Idaho State Department of Agriculture, Caribou Soil and Water Conservation District, and the U.S. Forest Service.

A community must incorporate a variety of strategies in order to develop a comprehensive drinking water protection plan, be they regulatory in nature (i.e. zoning, permitting) or non-regulatory in nature (i.e. good housekeeping, public education, specific best management practices). For assistance in developing protection strategies please contact the Pocatello Regional Office of the IDEQ or the Idaho Rural Water Association.

Assistance

Public water supplies and others may call the following IDEQ offices with questions about this assessment and to request assistance with developing and implementing a local protection plan. In addition, draft protection plans may be submitted to the IDEQ office for preliminary review and comments.

Pocatello Regional DEQ Office	(208) 236-6160
State DEQ Office	(208) 373-0502

Website: www.deq.state.id.us

Water suppliers serving fewer than 10,000 persons may contact Melinda Harper (mharper@idahoruralwater.com), Idaho Rural Water Association, at (208) 343-7001 for assistance with drinking water protection (formerly wellhead protection) strategies.

POTENTIAL CONTAMINANT INVENTORY LIST OF ACRONYMS AND DEFINITIONS

AST (Aboveground Storage Tanks) – Sites with aboveground storage tanks.

Business Mailing List – This list contains potential contaminant sites identified through a yellow pages database search of standard industry codes (SIC).

CERCLA – This includes sites considered for listing under the **Comprehensive Environmental Response Compensation and Liability Act (CERCLA)**. CERCLA, more commonly known as Superfund and are designed to clean up hazardous waste sites that are on the national priority list (NPL).

Cyanide Site – DEQ permitted and known historical sites/facilities using cyanide.

Dairy – Sites included in the primary contaminant source inventory represent those facilities regulated by Idaho State Department of Agriculture (ISDA) and may range from a few head to several thousand head of milking cows.

Deep Injection Well – Injection wells regulated under the Idaho Department of Water Resources generally for the disposal of stormwater runoff or agricultural field drainage.

Enhanced Inventory – Enhanced inventory locations are potential contaminant source sites added by the water system. These can include new sites not captured during the primary contaminant inventory, or corrected locations for sites not properly located during the primary contaminant inventory. Enhanced inventory sites can also include miscellaneous sites added by the Idaho Department of Environmental Quality (DEQ) during the primary contaminant inventory.

Floodplain – This is a coverage of the 100year floodplains.

Group 1 Sites – These are sites that show elevated levels of contaminants and are not within the priority one areas.

Inorganic Priority Area – Priority one areas where greater than 25% of the wells/springs show constituents higher than primary standards or other health standards.

Landfill – Areas of open and closed municipal and non-municipal landfills.

LUST (Leaking Underground Storage Tank) – Potential contaminant source sites associated with leaking underground storage tanks as regulated under RCRA.

Mines and Quarries – Mines and quarries permitted through the Idaho Department of Lands.)

Nitrate Priority Area – Area where greater than 25% of wells/springs show nitrate values above 5mg/l.

NPDES (National Pollutant Discharge Elimination System) – Sites with NPDES permits. The Clean Water Act requires that any discharge of a pollutant to waters of the United States from a point source must be authorized by an NPDES permit.

Organic Priority Areas – These are any areas where greater than 25 % of wells/springs show levels greater than 1% of the primary standard or other health standards.

Recharge Point – This includes active, proposed, and possible recharge sites on the Snake River Plain.

RCRA – Site regulated under **Resource Conservation Recovery Act (RCRA)**. RCRA is commonly associated with the cradle to grave management approach for generation, storage, and disposal of hazardous wastes.

SARA Tier II (Superfund Amendments and Reauthorization Act Tier II Facilities) – These sites store certain types and amounts of hazardous materials and must be identified under the Community Right to Know Act.

Toxic Release Inventory (TRI) – The toxic release inventory list was developed as part of the Emergency Planning and Community Right to Know (Community Right to Know) Act passed in 1986. The Community Right to Know Act requires the reporting of any release of a chemical found on the TRI list.

UST (Underground Storage Tank) – Potential contaminant source sites associated with underground storage tanks regulated as regulated under RCRA.

Wastewater Land Applications Sites – These are areas where the land application of municipal or industrial wastewater is permitted by DEQ.

Wellheads – These are drinking water well locations regulated under the Safe Drinking Water Act. They are not treated as potential contaminant sources.

NOTE: Many of the potential contaminant sources were located using a geocoding program where mailing addresses are used to locate a facility. Field verification of potential contaminant sources is an important element of an enhanced inventory.

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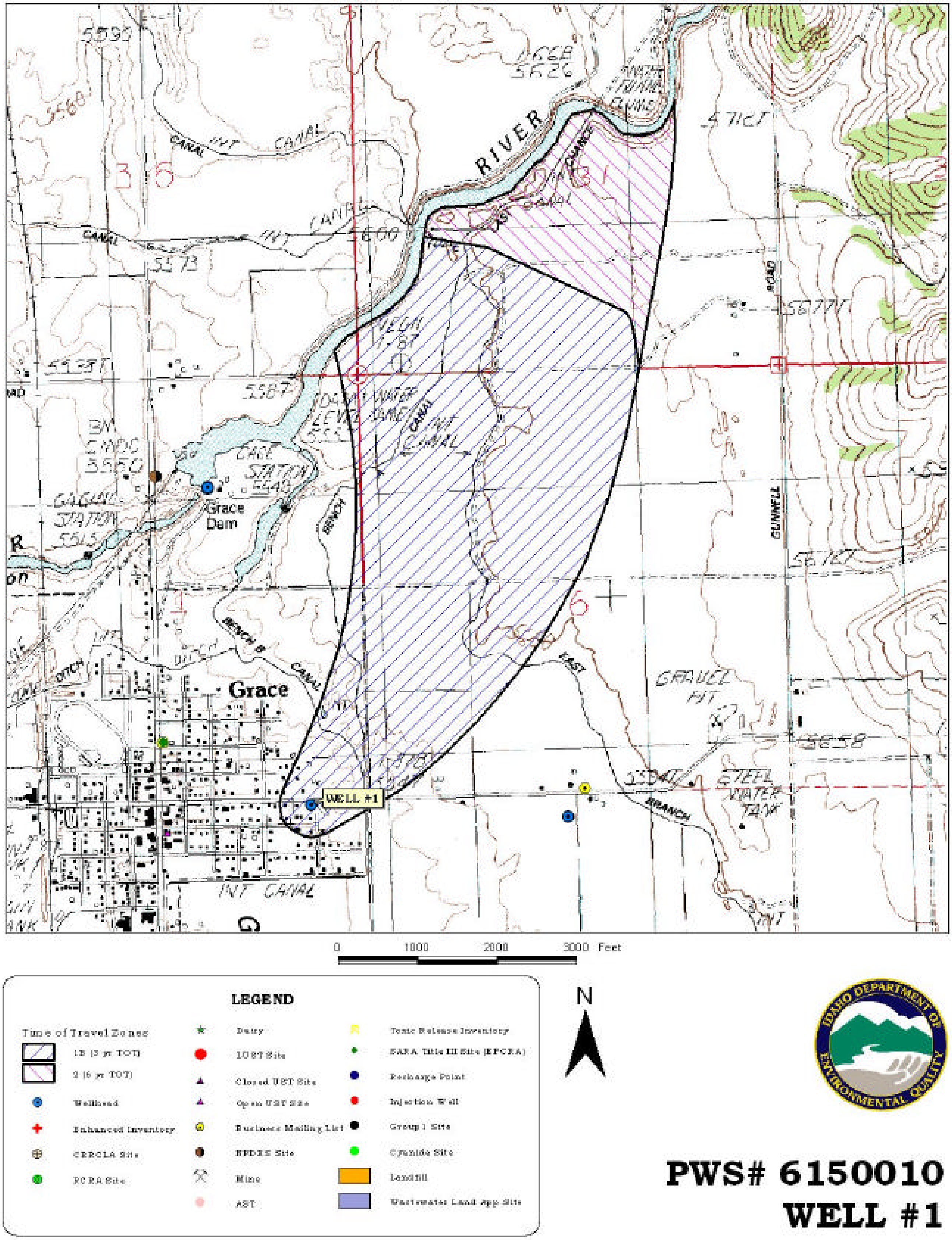
Safe Drinking Water Information System (SDWIS). Idaho Department of Environmental Quality.

Washington Group International, Inc, January 2002. Source Area Delineation Report for the Bear River Basin.

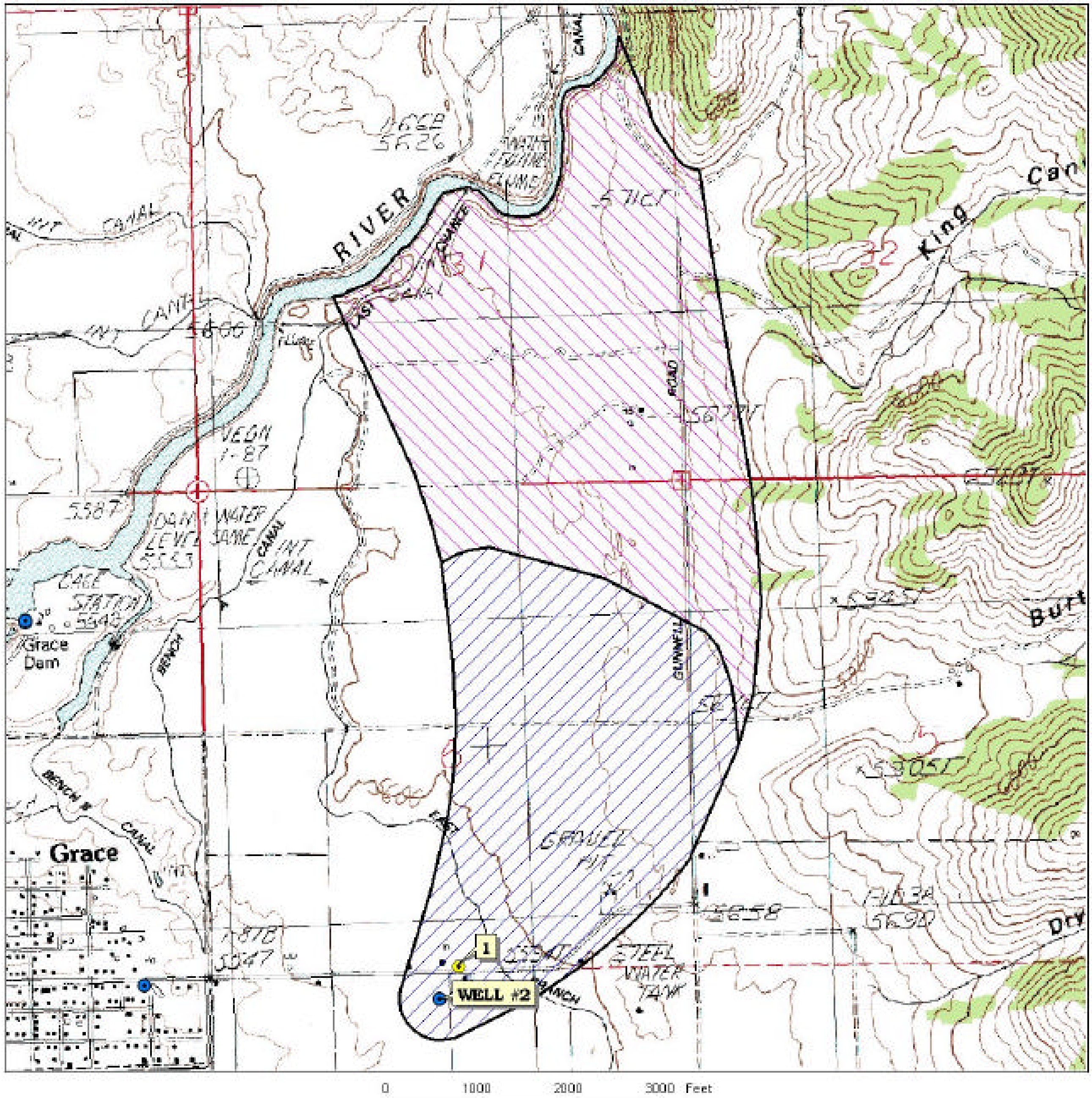
Attachment A
City of Grace
Figures 2 - 9
and
Susceptibility Analysis
Worksheets

FIGURE 2. City of Grace Delineation Map and Potential Contaminant Source Locations



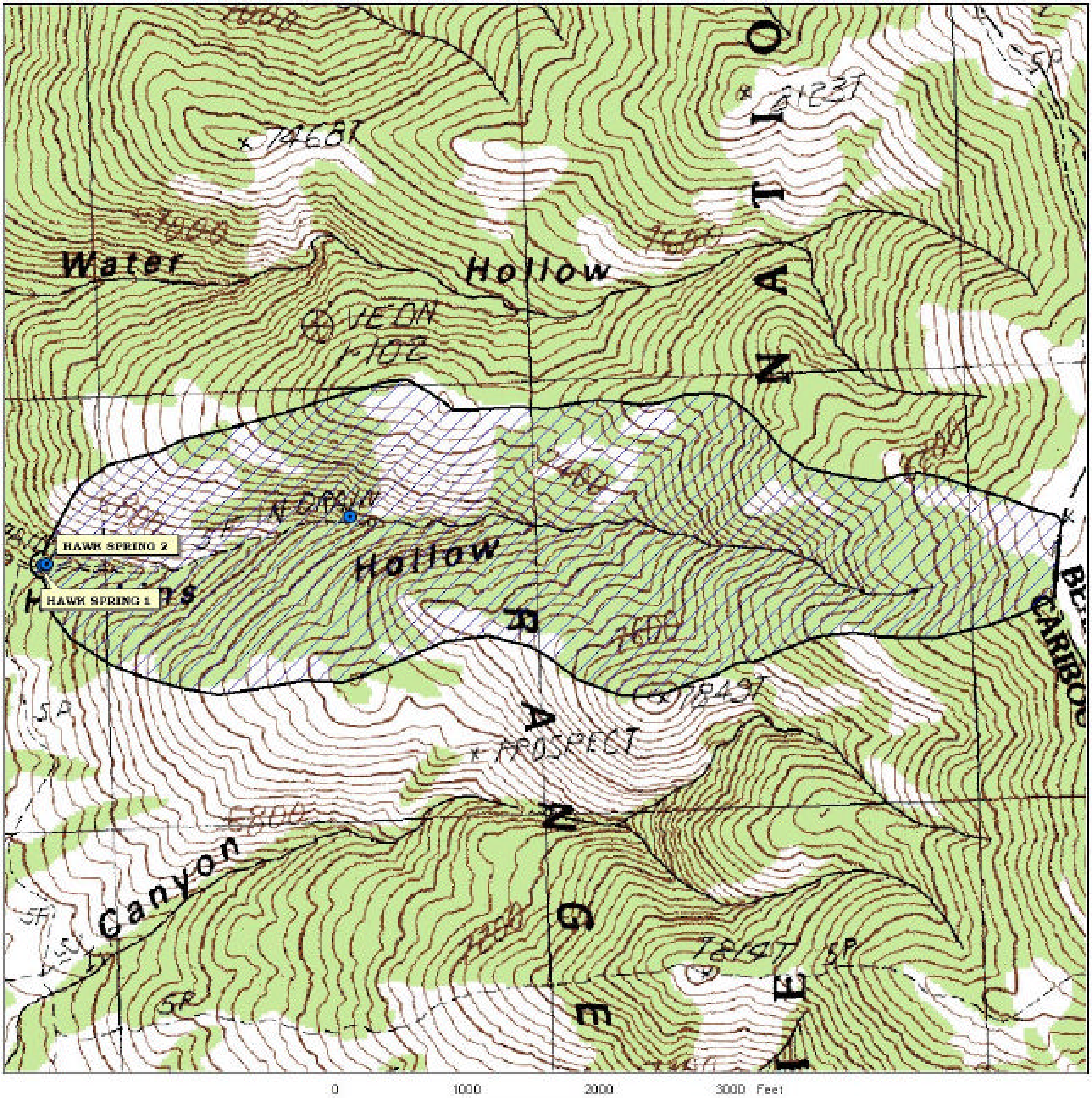
PWS# 6150010
WELL #1

FIGURE 3. City of Grace Delineation Map and Potential Contaminant Source Locations



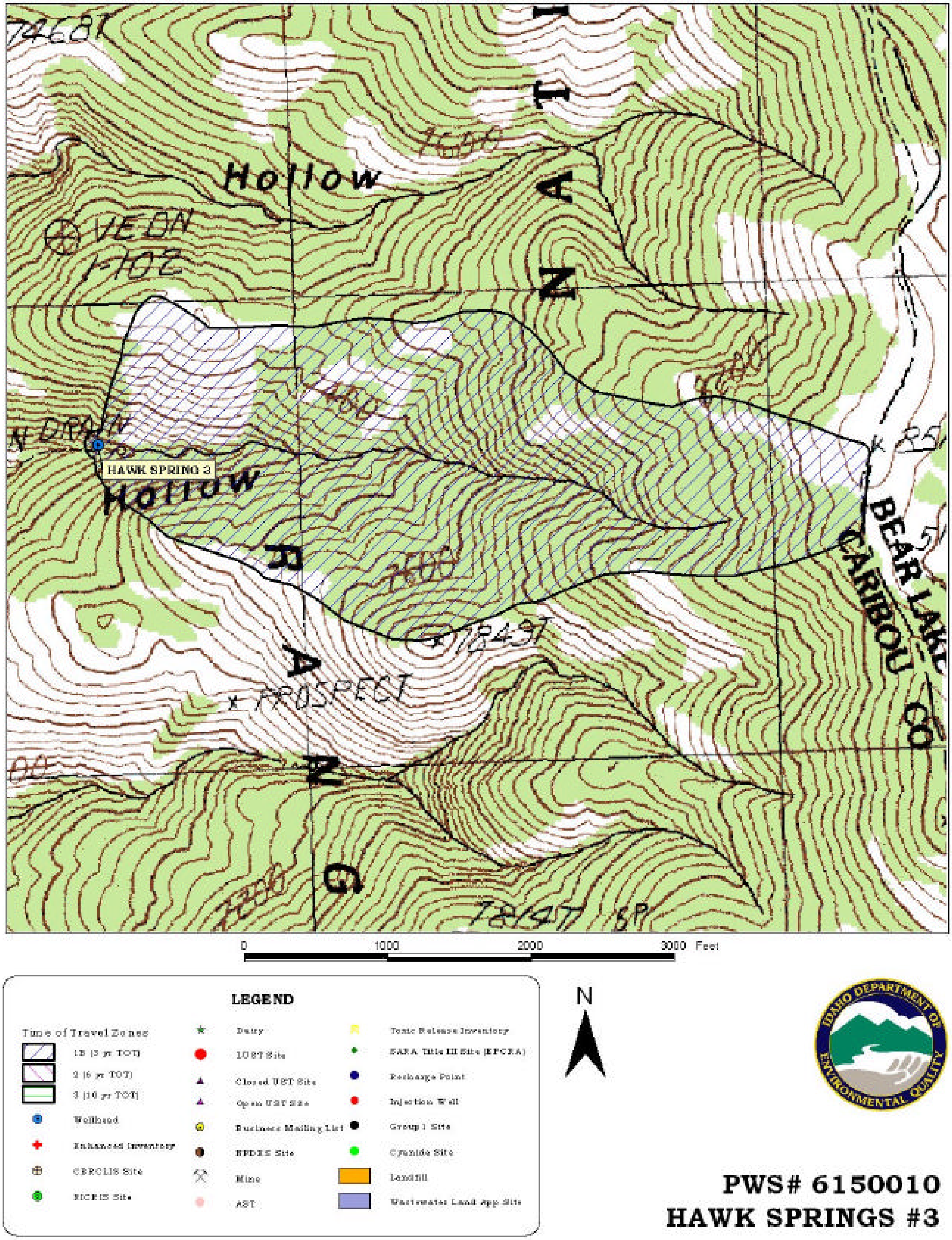
PWS# 6150010
WELL #2

FIGURE 4. City of Grace Delineation Map and Potential Contaminant Source Locations



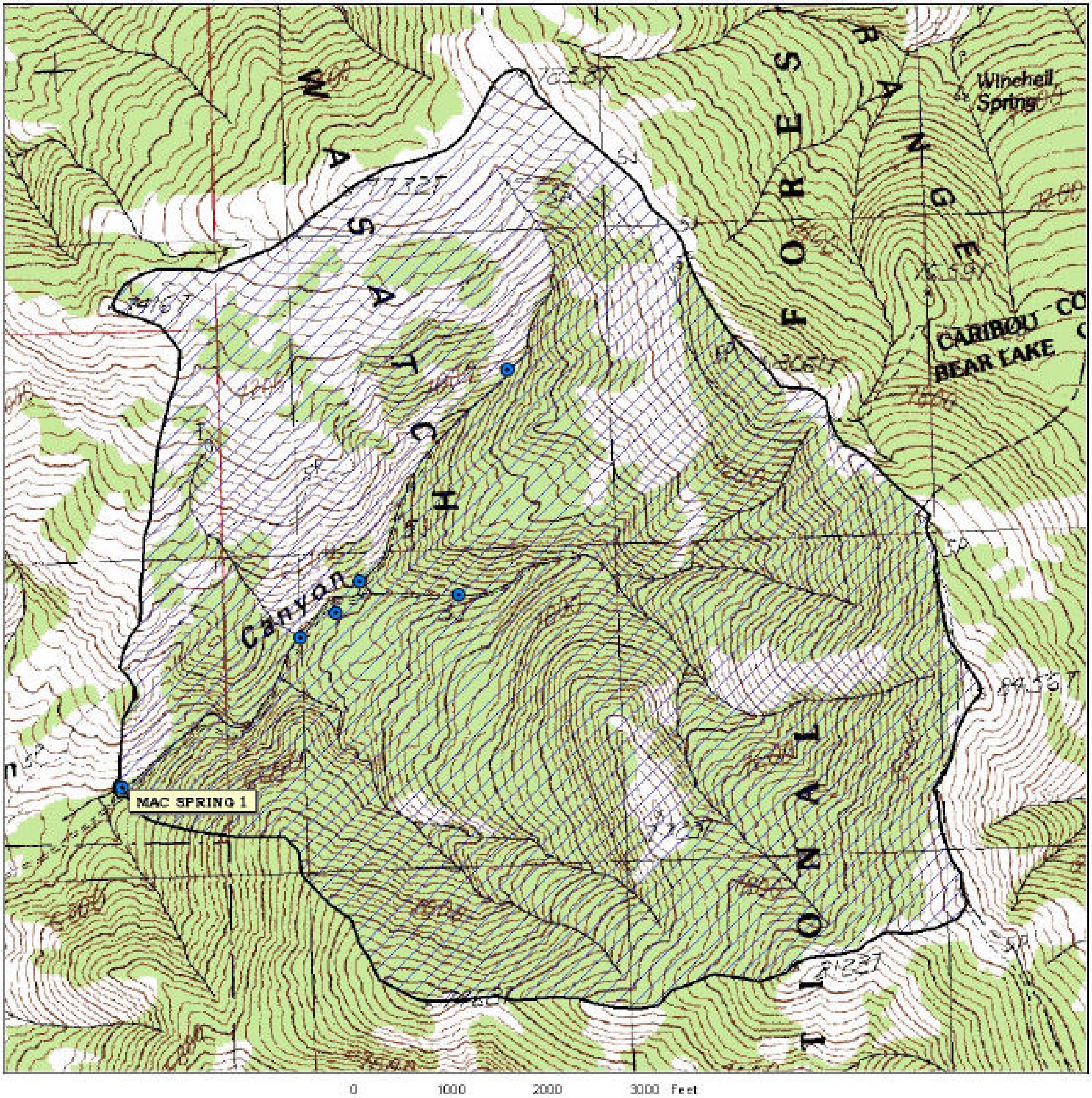
PWS# 6150010
HAWK SPRINGS #1 & #2

FIGURE 5. City of Grace Delineation Map and Potential Contaminant Source Locations



PWS# 6150010
HAWK SPRINGS #3

FIGURE 6. City of Grace Delineation Map and Potential Contaminant Source Locations



PWS# 6150010
MAC SPRING 1

FIGURE 7. City of Grace Delineation Map and Potential Contaminant Source Locations

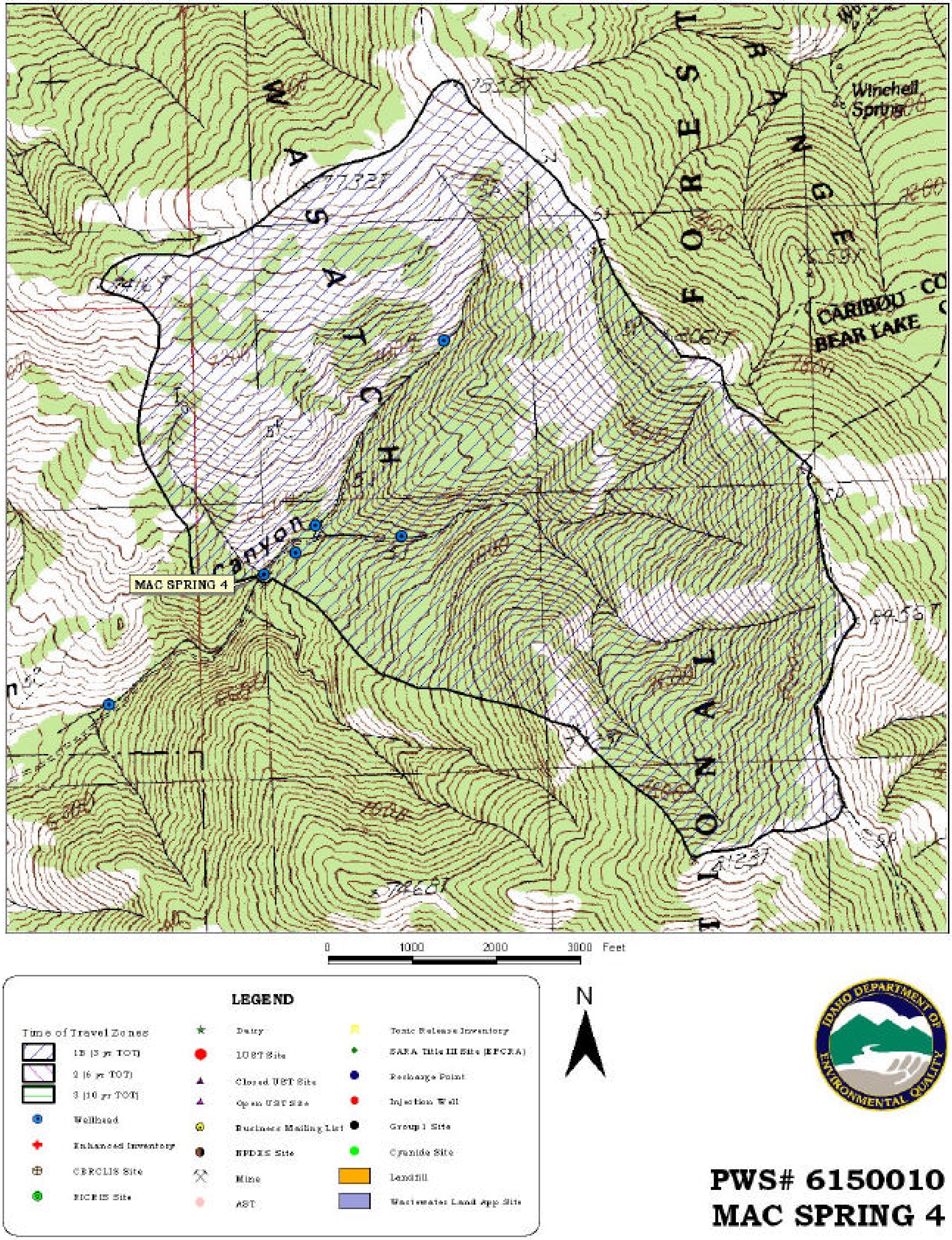
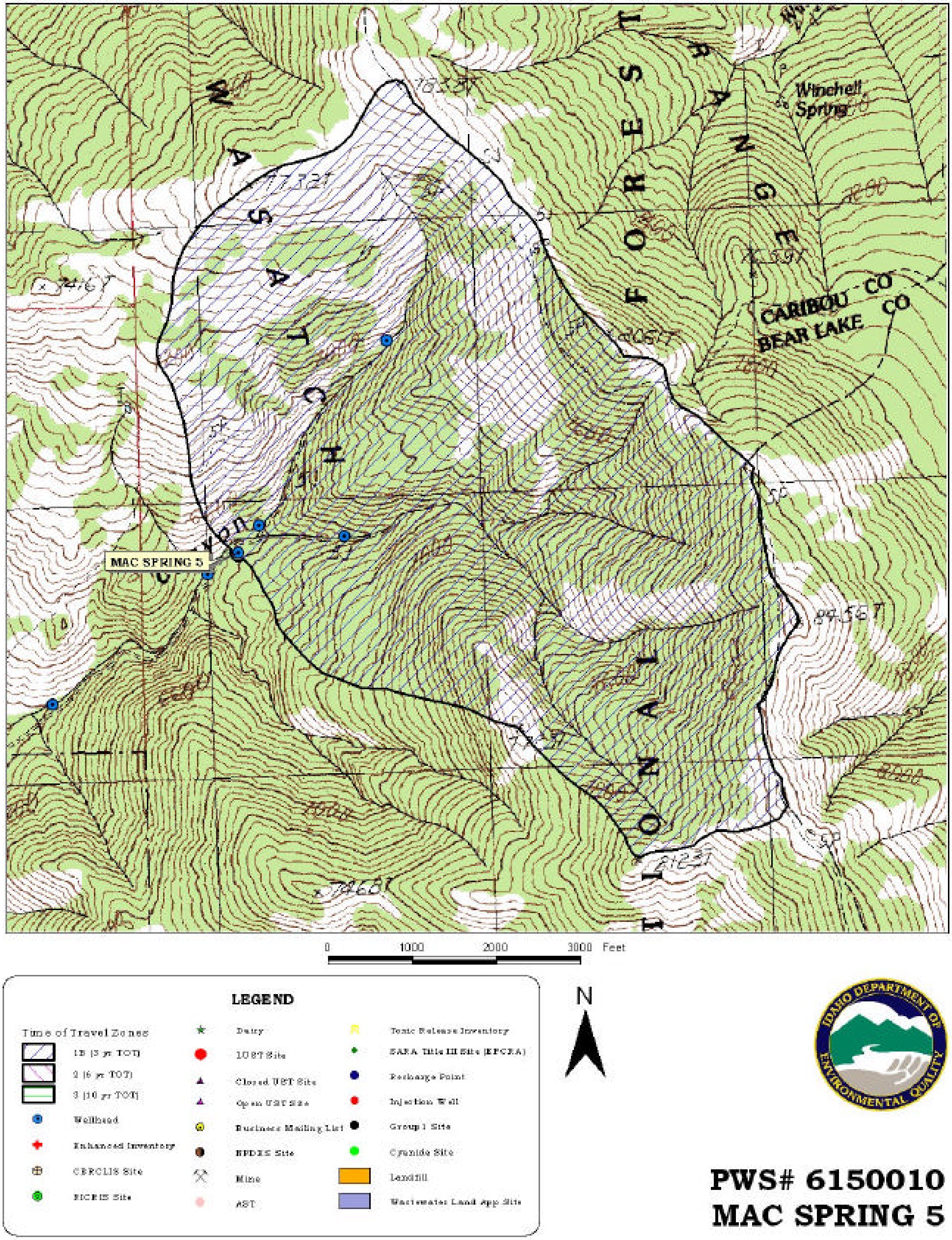
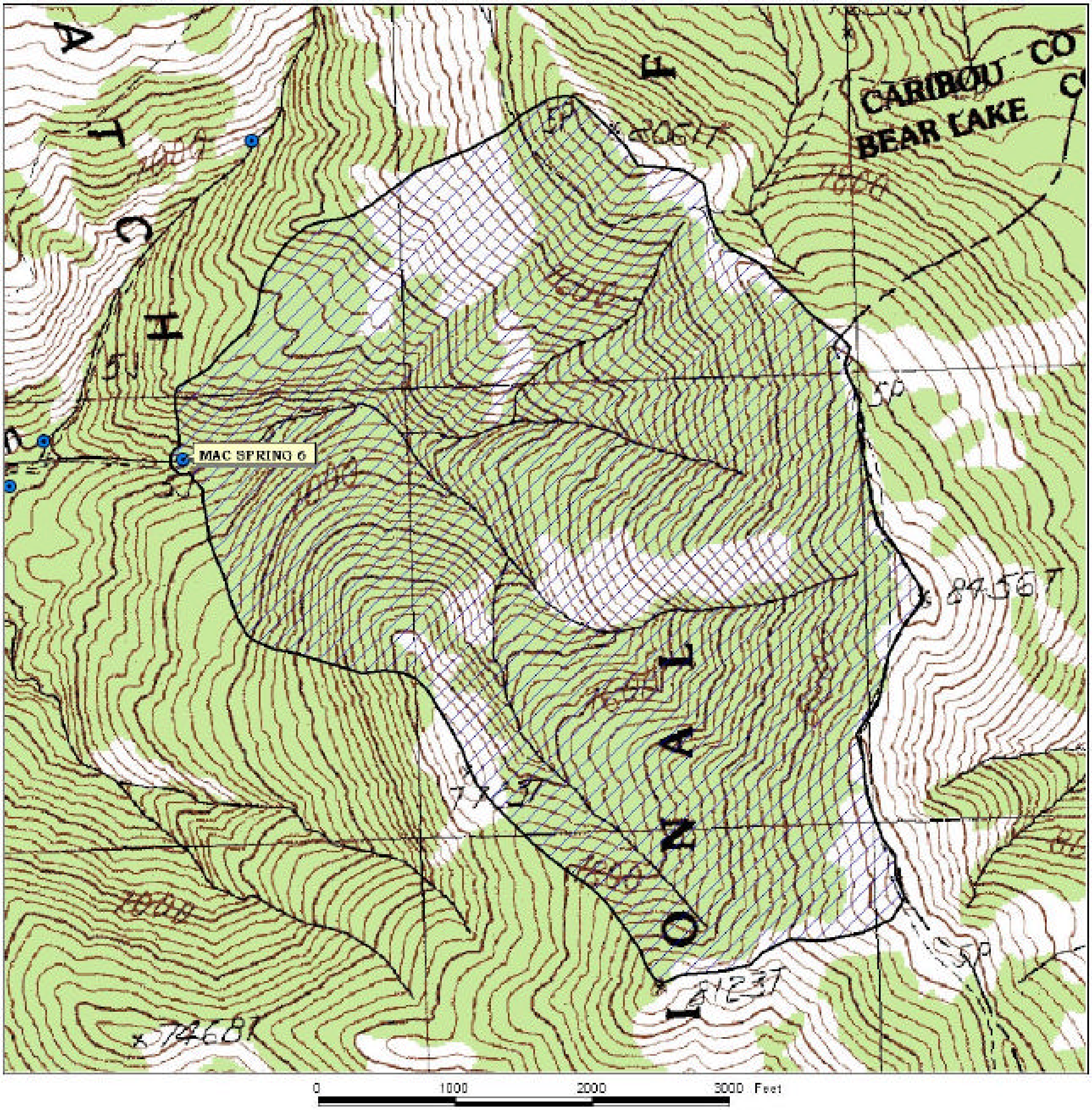


FIGURE 8. City of Grace Delineation Map and Potential Contaminant Source Locations



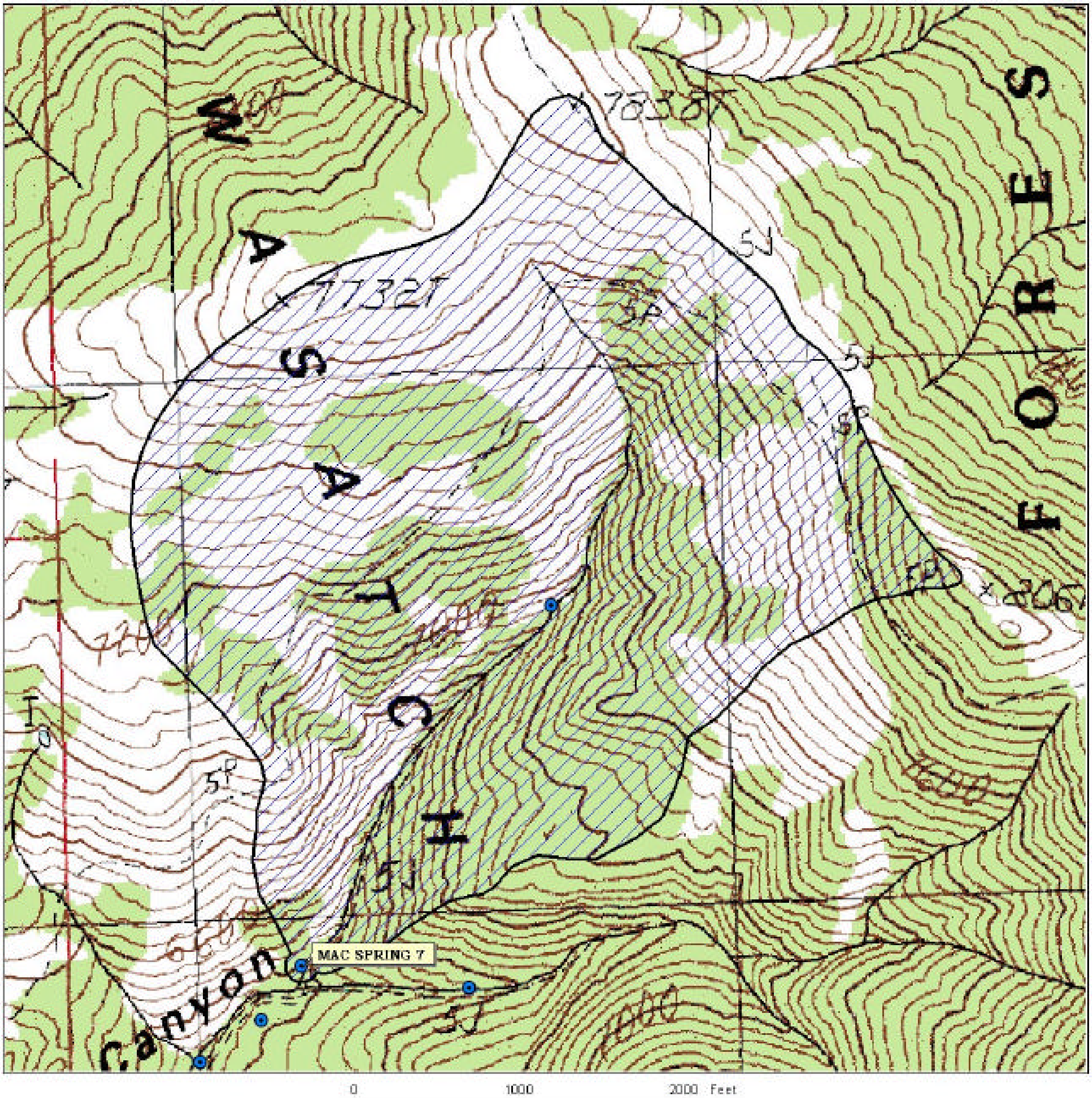
PWS# 6150010
MAC SPRING 5

FIGURE 9. City of Grace Delineation Map and Potential Contaminant Source Locations



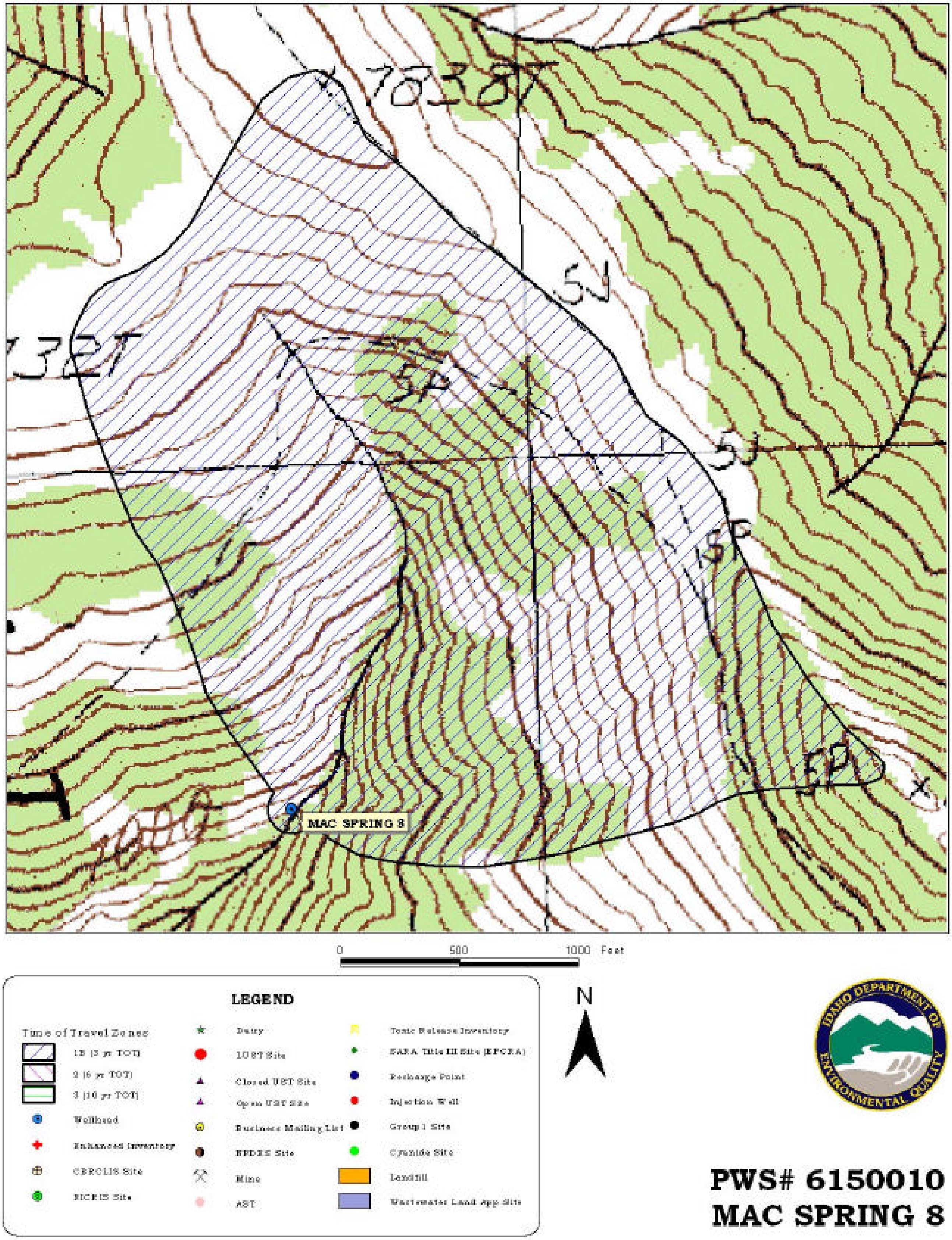
PWS# 6150010
MAC SPRING 6

FIGURE 10. City of Grace Delineation Map and Potential Contaminant Source Locations



PWS# 6150010
MAC SPRING 7

FIGURE 11. City of Grace Delineation Map and Potential Contaminant Source Locations



PWS# 6150010
MAC SPRING 8

Susceptibility Analysis Formulas

Formula for Well Sources

The final well scores for the susceptibility analysis were determined using the following formulas:

1) VOC/SOC/IOC Final Score = Hydrologic Sensitivity + System Construction + (Potential Contaminant/Land Use x 0.222)

2) Microbial Final Score = Hydrologic Sensitivity + System Construction + (Potential Contaminant/Land Use x 0.375)

Final Susceptibility Scoring:

0 - 5 Low Susceptibility
6 - 12 Moderate Susceptibility
≥ 13 High Susceptibility

Formula for Spring Sources

The final spring scores for the susceptibility analysis were determined using the following formulas:

1. VOC/SOC/IOC/ Final Score = (Potential Contaminant/Land Use X 0.818) + System Construction

2. Microbial Final Score = (Potential Contaminant/Land Use X 1.125) + System Construction

Final Susceptibility Scoring:

0 - 7 Low Susceptibility
8 - 15 Moderate Susceptibility
≥ 16 High Susceptibility

Ground Water Susceptibility Report   Public Water System Name : GRACE CITY OF   Well# : WELL #1
Public Water System Number 6150010   09/03/2002 12:38:55 PM

1. System Construction

		SCORE
Drill Date	08/19/1989	
Driller Log Available	YES	
Sanitary Survey (if yes, indicate date of last survey)	YES	2000
Well meets IDWR construction standards	NO	1
Wellhead and surface seal maintained	NO	1
Casing and annular seal extend to low permeability unit	NO	1
Highest production 100 feet below static water level	NO	1
Well located outside the 100 year flood plain	YES	0
	Total System Construction Score	4

2. Hydrologic Sensitivity

Soils are poorly to moderately drained	NO	2
Vadose zone composed of gravel, fractured rock or unknown	NO	0
Depth to first water > 300 feet	NO	1
Aquitard present with > 50 feet cumulative thickness	YES	0
	Total Hydrologic Score	3

3. Potential Contaminant / Land Use - ZONE 1A

		IOC Score	VOC Score	SOC Score	Microbial Score
Land Use Zone 1A	IRRIGATED CROPLAND	2	2	2	2
Farm chemical use high	YES	0	0	2	
IOC, VOC, SOC, or Microbial sources in Zone 1A	NO	NO	NO	NO	NO
Total Potential Contaminant Source/Land Use Score - Zone 1A		2	2	4	2

Potential Contaminant / Land Use - ZONE 1B

		IOC Score	VOC Score	SOC Score	Microbial Score
Contaminant sources present (Number of Sources)	YES	1	1	1	1
(Score = # Sources X 2) 8 Points Maximum		2	2	2	2
Sources of Class II or III leacheable contaminants or	YES	5	1	1	
4 Points Maximum		4	2	2	
Zone 1B contains or intercepts a Group 1 Area	YES	2	0	0	0
Land use Zone 1B	Greater Than 50% Irrigated Agricultural Land	4	4	4	4
Total Potential Contaminant Source / Land Use Score - Zone 1B		12	8	8	6

Potential Contaminant / Land Use - ZONE II

		IOC Score	VOC Score	SOC Score	Microbial Score
Contaminant Sources Present	YES	2	2	2	
Sources of Class II or III leacheable contaminants or	YES	1	1	1	
Land Use Zone II	Greater Than 50% Irrigated Agricultural Land	2	2	2	
Potential Contaminant Source / Land Use Score - Zone II		5	5	5	0

	IOC	VOC	SOC	Microbial
Cumulative Potential Contaminant / Land Use Score	19	15	17	8
4. Final Susceptibility Source Score	11	10	11	10
5. Final Well Ranking	Moderate	Moderate	Moderate	Moderate

		SCORE			
1. System Construction					
Drill Date	04/01/1980				
Driller Log Available	YES				
Sanitary Survey (if yes, indicate date of last survey)	YES	2000			
Well meets IDWR construction standards	NO	1			
Wellhead and surface seal maintained	NO	1			
Casing and annular seal extend to low permeability unit	NO	2			
Highest production 100 feet below static water level	NO	1			
Well located outside the 100 year flood plain	YES	0			
	Total System Construction Score	5			
2. Hydrologic Sensitivity					
Soils are poorly to moderately drained	NO	2			
Vadose zone composed of gravel, fractured rock or unknown	YES	1			
Depth to first water > 300 feet	NO	1			
Aquitard present with > 50 feet cumulative thickness	NO	2			
	Total Hydrologic Score	6			
3. Potential Contaminant / Land Use - ZONE 1A		IOC Score	VOC Score	SOC Score	Microbial Score
Land Use Zone 1A	IRRIGATED CROPLAND	2	2	2	2
Farm chemical use high	YES	0	0	2	
IOC, VOC, SOC, or Microbial sources in Zone 1A	NO	NO	NO	NO	NO
	Total Potential Contaminant Source/Land Use Score - Zone 1A	2	2	4	2
Potential Contaminant / Land Use - ZONE 1B					
Contaminant sources present (Number of Sources)	YES	2	1	2	2
(Score = # Sources X 2) 8 Points Maximum		4	2	4	4
Sources of Class II or III leacheable contaminants or	YES	5	1	1	
4 Points Maximum		4	1	1	
Zone 1B contains or intercepts a Group 1 Area	YES	2	0	0	0
Land use Zone 1B	Greater Than 50% Irrigated Agricultural Land	4	4	4	4
	Total Potential Contaminant Source / Land Use Score - Zone 1B	14	7	10	8
Potential Contaminant / Land Use - ZONE II					
Contaminant Sources Present	YES	2	2	2	
Sources of Class II or III leacheable contaminants or	YES	1	1	1	
Land Use Zone II	Greater Than 50% Irrigated Agricultural Land	2	2	2	
	Potential Contaminant Source / Land Use Score - Zone II	5	5	5	0
Cumulative Potential Contaminant / Land Use Score		21	14	14	10
4. Final Susceptibility Source Score		16	14	14	17
5. Final Well Ranking		High	High	High	High

Surface Water Susceptibility Report   Public Water System Name : GRACE CITY OF   Well# : HAWK SPRING 1
Public Water System Number 6150010   09/10/2002 4:15:44 PM

1. System Construction		SCORE
Intake structure properly constructed	NO	1
Is the water first collected from an underground source Yes=spring developed to collect water from beneath the ground; higher score No=water collected after it contacts the atmosphere or unknown; lower score	YES	0
Total System Construction Score		1

2. Potential Contaminant / Land Use - ZONE 1A		Score	IOC Score	VOC Score	SOC Score	Microbial
Land Use Zone 1A	RANGELAND, WOODLAND, BASALT	0	0	0	0	
Farm chemical use high	YES	0	0	2		
IOC, VOC, SOC, or Microbial sources in Zone 1A	NO	NO	NO	NO	NO	
Total Potential Contaminant Source/Land Use Score - Zone 1A		0	0	2	0	
Potential Contaminant / Land Use - ZONE 1B						
Contaminant sources present (Number of Sources)	YES	1	0	0	1	
(Score = # Sources X 2) 8 Points Maximum		2	0	0	2	
Sources of Class II or III leacheable contaminants or	NO	0	0	0		
4 Points Maximum		0	0	0		
Zone 1B contains or intercepts a Group 1 Area	NO	0	0	0	0	
Land use Zone 1B	Less Than 25% Agricultural Land	0	0	0	0	
Total Potential Contaminant Source / Land Use Score - Zone 1B		2	0	0	2	
Cumulative Potential Contaminant / Land Use Score		2	0	2	2	
4. Final Susceptibility Source Score		3	2	3	3	
5. Final Well Ranking		Low	Low	Low	Low	

Surface Water Susceptibility Report   Public Water System Name : GRACE CITY OF   Well# : HAWK SPRING 2

Public Water System Number 6150010   09/10/2002 4:15:44 PM

1. System Construction

		SCORE
Intake structure properly constructed	NO	1
Is the water first collected from an underground source Yes=spring developed to collect water from beneath the ground; higher score No=water collected after it contacts the atmosphere or unknown; lower score	YES	0
Total System Construction Score		1

2. Potential Contaminant / Land Use - ZONE 1A

		Score	IOC Score	VOC Score	SOC Score	Microbial
Land Use Zone 1A	RANGELAND, WOODLAND, BASALT	0	0	0	0	
Farm chemical use high	YES	0	0	2		
IOC, VOC, SOC, or Microbial sources in Zone 1A	NO	NO	NO	NO	NO	
Total Potential Contaminant Source/Land Use Score - Zone 1A		0	0	2	0	

Potential Contaminant / Land Use - ZONE 1B

Contaminant sources present (Number of Sources)	YES	1	0	0	1
(Score = # Sources X 2) 8 Points Maximum		2	0	0	2
Sources of Class II or III leacheable contaminants or	NO	0	0	0	
4 Points Maximum		0	0	0	
Zone 1B contains or intercepts a Group 1 Area	NO	0	0	0	0
Land use Zone 1B	Less Than 25% Agricultural Land	0	0	0	0
Total Potential Contaminant Source / Land Use Score - Zone 1B		2	0	0	2

Cumulative Potential Contaminant / Land Use Score	2	0	2	2
4. Final Susceptibility Source Score	3	1	3	3
5. Final Well Ranking	Low	Low	Low	Low

Surface Water Susceptibility Report — Public Water System Name : GRACE CITY OF — Well# : HAWK SPRING 3
Public Water System Number 6150010 — 09/10/2002 4:15:44 PM

1. System Construction

		SCORE
Intake structure properly constructed	NO	1
Is the water first collected from an underground source Yes=spring developed to collect water from beneath the ground; higher score No=water collected after it contacts the atmosphere or unknown; lower score	YES	0
Total System Construction Score		1

2. Potential Contaminant / Land Use - ZONE 1A

		Score	IOC Score	VOC Score	SOC Score	Microbial
Land Use Zone 1A	RANGELAND, WOODLAND, BASALT	0	0	0	0	
Farm chemical use high	YES	0	0	2		
IOC, VOC, SOC, or Microbial sources in Zone 1A	NO	NO	NO	NO	NO	
Total Potential Contaminant Source/Land Use Score - Zone 1A		0	0	2	0	

Potential Contaminant / Land Use - ZONE 1B

		Score	IOC Score	VOC Score	SOC Score
Contaminant sources present (Number of Sources)	YES	1	0	0	1
(Score = # Sources X 2) 8 Points Maximum		2	0	0	2
Sources of Class II or III leacheable contaminants or	NO	0	0	0	
4 Points Maximum		0	0	0	
Zone 1B contains or intercepts a Group 1 Area	NO	0	0	0	0
Land use Zone 1B	Less Than 25% Agricultural Land	0	0	0	0
Total Potential Contaminant Source / Land Use Score - Zone 1B		2	0	0	2
Cumulative Potential Contaminant / Land Use Score		2	0	2	2
4. Final Susceptibility Source Score		3	1	3	3
5. Final Well Ranking		Low	Low	Low	Low

Surface Water Susceptibility Report   Public Water System Name : GRACE CITY OF   Well# : MAC SPRING 1
Public Water System Number 6150010   09/10/2002 4:17:21 PM

1. System Construction

		SCORE
Intake structure properly constructed	NO	1
Is the water first collected from an underground source Yes=spring developed to collect water from beneath the ground; higher score No=water collected after it contacts the atmosphere or unknown; lower score	YES	0
Total System Construction Score		1

2. Potential Contaminant / Land Use - ZONE 1A

		IOC Score	VOC Score	SOC Score	Microbial Score
Land Use Zone 1A	RANGELAND, WOODLAND, BASALT	0	0	0	0
Farm chemical use high	NO	0	0	0	
IOC, VOC, SOC, or Microbial sources in Zone 1A	NO	NO	NO	NO	NO
Total Potential Contaminant Source/Land Use Score - Zone 1A		0	0	0	0

Potential Contaminant / Land Use - ZONE 1B

		IOC Score	VOC Score	SOC Score	Microbial Score
Contaminant sources present (Number of Sources)	YES	1	0	0	1
(Score = # Sources X 2) 8 Points Maximum		2	0	0	2
Sources of Class II or III leacheable contaminants or	YES	1	0	0	
4 Points Maximum		1	0	0	
Zone 1B contains or intercepts a Group 1 Area	NO	0	0	0	0
Land use Zone 1B	Less Than 25% Agricultural Land	0	0	0	0
Total Potential Contaminant Source / Land Use Score - Zone 1B		3	0	0	2
Cumulative Potential Contaminant / Land Use Score		3	0	0	2

	IOC	VOC	SOC	Microbial
3. Final Susceptibility Source Score	4	1	1	3
4. Final Well Ranking	Low	Low	Low	Low

Surface Water Susceptibility Report   Public Water System Name : GRACE CITY OF   Well# : MAC SPRING 4
Public Water System Number 6150010   09/10/2002 4:18:41 PM

1. System Construction

		SCORE
Intake structure properly constructed	NO	1
Is the water first collected from an underground source Yes=spring developed to collect water from beneath the ground; higher score No=water collected after it contacts the atmosphere or unknown; lower score	YES	0
Total System Construction Score		1

2. Potential Contaminant / Land Use - ZONE 1A

		IOC Score	VOC Score	SOC Score	Microbial Score
Land Use Zone 1A	RANGELAND, WOODLAND, BASALT	0	0	0	0
Farm chemical use high	NO	0	0	0	
IOC, VOC, SOC, or Microbial sources in Zone 1A	NO	NO	NO	NO	NO
Total Potential Contaminant Source/Land Use Score - Zone 1A		0	0	0	0

Potential Contaminant / Land Use - ZONE 1B

		IOC Score	VOC Score	SOC Score	Microbial Score
Contaminant sources present (Number of Sources)	YES	1	0	0	1
(Score = # Sources X 2) 8 Points Maximum		2	0	0	2
Sources of Class II or III leacheable contaminants or	YES	1	0	0	
4 Points Maximum		1	0	0	
Zone 1B contains or intercepts a Group 1 Area	NO	0	0	0	0
Land use Zone 1B	Less Than 25% Agricultural Land	0	0	0	0
Total Potential Contaminant Source / Land Use Score - Zone 1B		3	0	0	2
Cumulative Potential Contaminant / Land Use Score		3	0	0	2

	IOC	VOC	SOC	Microbial
3. Final Susceptibility Source Score	4	1	1	3
4. Final Well Ranking	Low	Low	Low	Low

Surface Water Susceptibility Report | Public Water System Name : GRACE CITY OF | Well# : MAC SPRING 5
Public Water System Number 6150010 | 09/10/2002 4:18:41 PM

1. System Construction

		SCORE
Intake structure properly constructed	NO	1
Is the water first collected from an underground source Yes=spring developed to collect water from beneath the ground; higher score No=water collected after it contacts the atmosphere or unknown; lower score	YES	0
Total System Construction Score		1

2. Potential Contaminant / Land Use - ZONE 1A

		IOC Score	VOC Score	SOC Score	Microbial Score
Land Use Zone 1A	RANGELAND, WOODLAND, BASALT	0	0	0	0
Farm chemical use high	NO	0	0	0	
IOC, VOC, SOC, or Microbial sources in Zone 1A	NO	NO	NO	NO	NO
Total Potential Contaminant Source/Land Use Score - Zone 1A		0	0	0	0

Potential Contaminant / Land Use - ZONE 1B

		IOC Score	VOC Score	SOC Score	Microbial Score
Contaminant sources present (Number of Sources)	YES	1	0	0	1
(Score = # Sources X 2) 8 Points Maximum		2	0	0	2
Sources of Class II or III leacheable contaminants or	YES	1	0	0	
4 Points Maximum		1	0	0	
Zone 1B contains or intercepts a Group 1 Area	NO	0	0	0	0
Land use Zone 1B	Less Than 25% Agricultural Land	0	0	0	0
Total Potential Contaminant Source / Land Use Score - Zone 1B		3	0	0	2
Cumulative Potential Contaminant / Land Use Score		3	0	0	2

3. Final Susceptibility Source Score

	IOC	VOC	SOC	Microbial
3. Final Susceptibility Source Score	4	1	1	3
4. Final Well Ranking	Low	Low	Low	Low

1. System Construction

		SCORE
Intake structure properly constructed	NO	1
Is the water first collected from an underground source Yes=spring developed to collect water from beneath the ground; higher score No=water collected after it contacts the atmosphere or unknown; lower score	YES	0
Total System Construction Score		1

2. Potential Contaminant / Land Use - ZONE 1A

		IOC Score	VOC Score	SOC Score	Microbial Score
Land Use Zone 1A	RANGELAND, WOODLAND, BASALT	0	0	0	0
Farm chemical use high	NO	0	0	0	
IOC, VOC, SOC, or Microbial sources in Zone 1A	NO	NO	NO	NO	NO
Total Potential Contaminant Source/Land Use Score - Zone 1A		0	0	0	0

Potential Contaminant / Land Use - ZONE 1B

		IOC Score	VOC Score	SOC Score	Microbial Score
Contaminant sources present (Number of Sources)	YES	1	0	0	1
(Score = # Sources X 2) 8 Points Maximum		2	0	0	2
Sources of Class II or III leacheable contaminants or	YES	1	0	0	
4 Points Maximum		1	0	0	
Zone 1B contains or intercepts a Group 1 Area	NO	0	0	0	0
Land use Zone 1B	Less Than 25% Agricultural Land	0	0	0	0
Total Potential Contaminant Source / Land Use Score - Zone 1B		3	0	0	2
Cumulative Potential Contaminant / Land Use Score		3	0	0	2

	IOC	VOC	SOC	Microbial
3. Final Susceptibility Source Score	4	1	1	3
4. Final Well Ranking	Low	Low	Low	Low

1. System Construction		SCORE
Intake structure properly constructed	NO	1
Is the water first collected from an underground source Yes=spring developed to collect water from beneath the ground; higher score No=water collected after it contacts the atmosphere or unknown; lower score	YES	0
Total System Construction Score		1

2. Potential Contaminant / Land Use - ZONE 1A		IOC Score	VOC Score	SOC Score	Microbial Score
Land Use Zone 1A	RANGELAND, WOODLAND, BASALT	0	0	0	0
Farm chemical use high	YES	0	0	2	
IOC, VOC, SOC, or Microbial sources in Zone 1A	NO	NO	NO	NO	NO
Total Potential Contaminant Source/Land Use Score - Zone 1A		0	0	2	0
Potential Contaminant / Land Use - ZONE 1B					
Contaminant sources present (Number of Sources)	YES	1	0	0	1
(Score = # Sources X 2) 8 Points Maximum		2	0	0	2
Sources of Class II or III leacheable contaminants or	YES	1	0	0	
4 Points Maximum		1	0	0	
Zone 1B contains or intercepts a Group 1 Area	NO	0	0	0	0
Land use Zone 1B	Less Than 25% Agricultural Land	0	0	0	0
Total Potential Contaminant Source / Land Use Score - Zone 1B		3	0	0	2
Cumulative Potential Contaminant / Land Use Score		0	0	2	2
3. Final Susceptibility Source Score		1	1	3	3
4. Final Well Ranking		Low	Low	Low	Low

Spring Susceptibility Report   Public Water System Name : GRACE CITY OF   Well# : MAC SPRING 8
Public Water System Number: 6150010   09/10/2002 4:21:47 PM

1. System Construction		SCORE
Intake structure properly constructed	NO	1
Is the water first collected from an underground source Yes=spring developed to collect water from beneath the ground; higher score No=water collected after it contacts the atmosphere or unknown; lower score	YES	0
Total System Construction Score		1

2. Potential Contaminant / Land Use - ZONE 1A		IOC Score	VOC Score	SOC Score	Microbial Score
Land Use Zone 1A	RANGELAND, WOODLAND, BASALT	0	0	0	0
Farm chemical use high	YES	0	0	2	
IOC, VOC, SOC, or Microbial sources in Zone 1A	NO	NO	NO	NO	NO
Total Potential Contaminant Source/Land Use Score - Zone 1A		0	0	2	0
Potential Contaminant / Land Use - ZONE 1B					
Contaminant sources present (Number of Sources)	NO	1	0	0	1
(Score = # Sources X 2) 8 Points Maximum		2	0	0	2
Sources of Class II or III leacheable contaminants or	NO	0	0	0	
4 Points Maximum		0	0	0	
Zone 1B contains or intercepts a Group 1 Area	NO	0	0	0	0
Land use Zone 1B	Less Than 25% Agricultural Land	0	0	0	0
Total Potential Contaminant Source / Land Use Score - Zone 1B		2	0	0	2
Cumulative Potential Contaminant / Land Use Score		2	0	2	2
3. Final Susceptibility Source Score		3	1	3	3
4. Final Well Ranking		Low	Low	Low	Low